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(54) Flexible Mat Structure

(57) A flexible mat structure incorporating one or more cavities (4) which are resilient under pressure and have a given height, said flexible structure being formed by covering both sides of a resilient, open, laid structure (1) of metal wire or synthetic yarn, with a covering (2, 3) of a plastics or elastomer material which is impervious to gases and liquids.

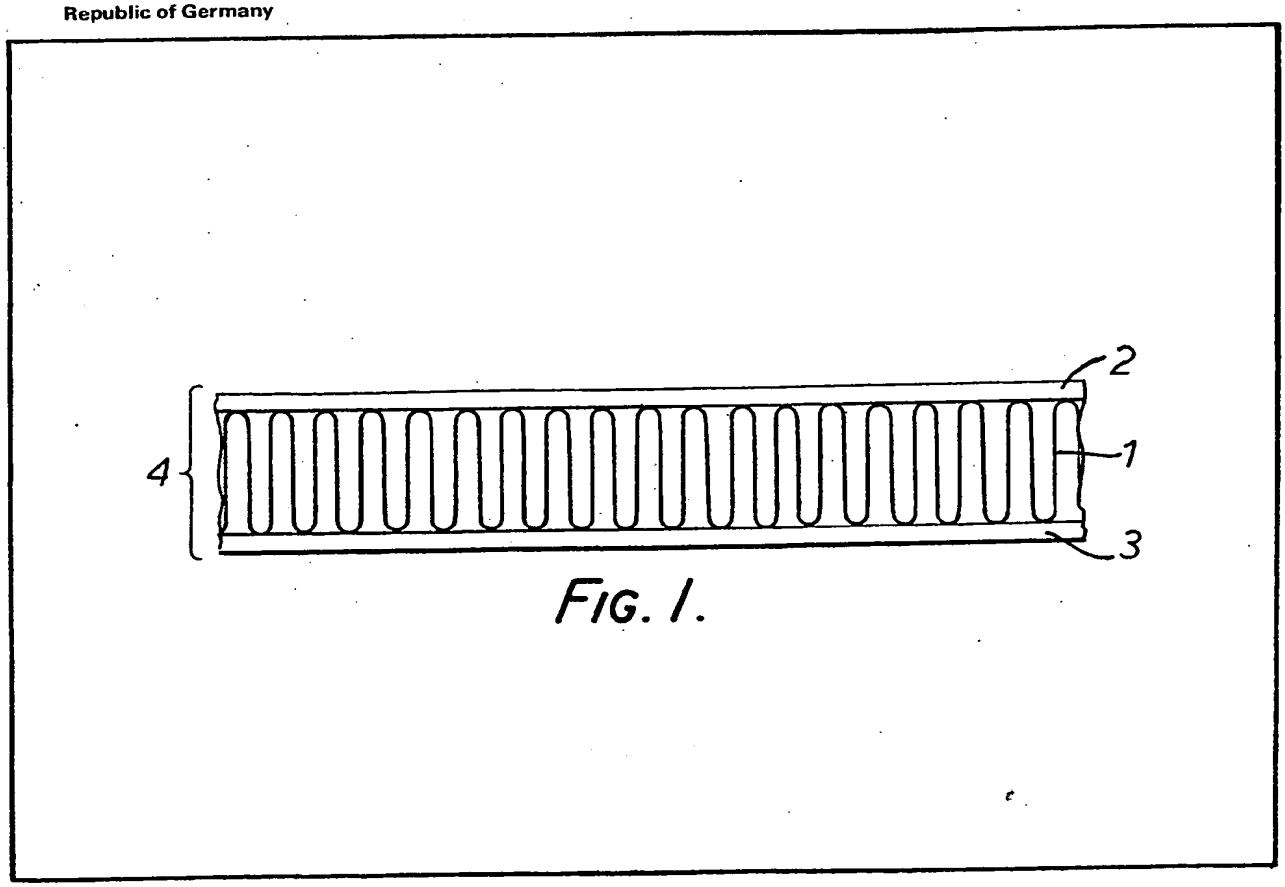

FIG. 1.

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

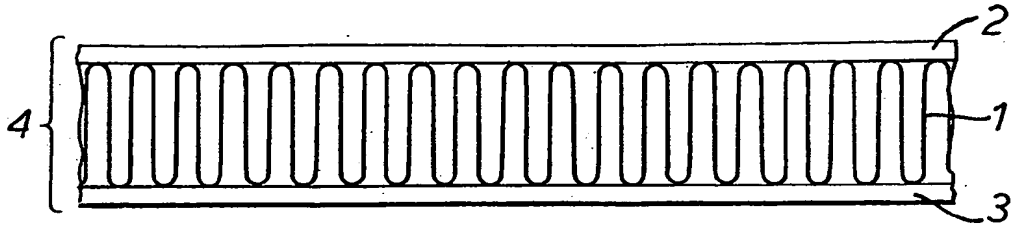

FIG. 1.

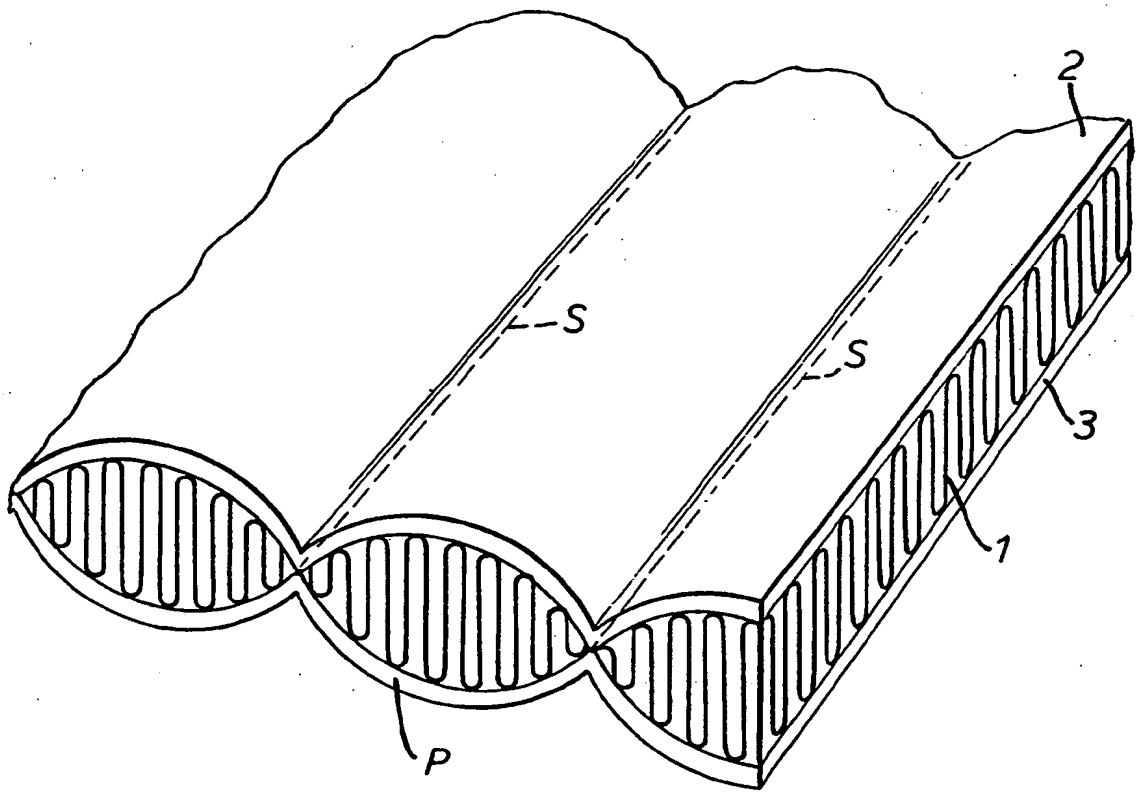

FIG. 2.

SPECIFICATION
Flexible Mat Structure

The present invention relates to a flexible mat structure.

Present-day developments, especially in the technology of barriers and insulation and in heat technology, are setting completely new standards for textile-type products. Low weight accompanied by a high specific strength, high flexibility together with good dimensional stability, ease of handling and joining, and make-up sizes which can be employed economically are the most important preconditions for the use of these products in, for example, textile-based construction, in the exploitation of solar energy, and in the fields of thermal and acoustic insulation and of moisture barriers.

Admittedly products made from foams, insulating boards, or from coated woven fabrics are currently available to architects and designers and these products enable many problems to be solved, but such known products can be applied only in a comparatively "one-sided" manner, in accordance with their specific characteristics. There is a need for a textile structural element to fill a gap in this range, through being capable of virtually universal application.

According to the invention, this object is achieved through the formation of a flexible mat structure incorporating one or more cavities which are resilient under pressure and have a given height, said flexible structure being formed by covering both sides of a resilient, open, laid structure of metal wire or synthetic yarn with a covering which is impervious to gases and liquids.

The proposal according to the invention permits the manufacture, in a particularly economical manner, of a flexible sheet-like or mat-like structure, this structure having a cavity of virtually any volume which may be desired. The hitherto known processes, such as, for example, the use of double-layer uncut pile fabrics, or of two layers of woven fabrics which are connected by binding warp, with coatings applied afterwards, are significantly more expensive than the present process.

The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:—

Figure 1 shows a diagrammatic cross-section of a mat in accordance with the present invention, and

Figure 2 shows a perspective diagrammatic view of another embodiment of a mat in accordance with the invention.

The mat of Figure 1 comprises a laid structure 1 made of metal wire or yarn, the structure having resilience and high permeability in the horizontal direction. The structure has coverings 2 and 3 which are impermeable to gases and liquids so as to form a cavity 4 which persists under pressure and bending.

The mat of Figure 2 is the same as that of Figure 1 except that it is sub-divided into longitudinal tubular sections P by a number of weld seams S. The seams can be made by high-frequency welds or by other processes such as sewing, depending on the use of the mat.

Thus a cavity is formed by covering an open, laid structure on both sides, it being possible, moreover, to make use of this cavity for conveying gases and liquids (e.g. heat-transport media). This cavity mat can be manufactured, in the greatest diversity of make-up sizes, as a closed mat body, or it can be manufactured in virtually any desired width and length, as continuous "material by the metre", and be matched to the dimensions pertaining to each application.

Open laid structures, made of metal wire or textile yarns, and having a given thickness are known and are not a subject of this invention. All varieties of such types of laid structures can be used within the scope of this manufacturing process for cavity mats according to the invention, provided that said structures are sufficiently resilient, and sufficiently open to leave space for adequate storage of gaseous or liquid media and for the unhindered through-flow of said media. These characteristics are exhibited, in particular, by laid structures made of resilient metal wire or synthetic monofilament yarns, but sheathed multifilament yarns or fibre yarns can also be suitable. The resilience can also be obtained by means of a final treatment of the finished laid structure, by impregnation or spraying.

The most diverse products and processes can be used for the covering on both sides. All plastomers or elastomers capable of being extruded or rolled-out can be applied to the laid structure as foils or foil-like coverings, both directly, in a continuous operation, or ready-made, commercially obtainable foils, can be applied to the surface of the laid structure in accordance with known processes (e.g. gluing, flame-laminating, and hot-laminating). When textile sheet-like structures are used, these can either be precoated, or they can be coated after application to the surface of the laid structure.

The most diverse products and processes can be used for covering each side of the open structure of laid material.

As examples of the plastics which can be used, the following products can be mentioned; polyvinyl chloride, polyethylene, polypropylene, polyurethane, chlorinated polyethylene, polymers containing fluorine and epoxy resins.

In the hot-melting process, the coating material is extruded, as a foil, from a die which is located immediately above the moving web of laid material. This preformed foil arrives directly on the substrate and can have a thickness of 10 μm to 3,000 μm, this thickness preferably being from 200 to 2,000 μm. The extrusion speed and the melting temperature depend on the material used.

When ready-made, commercially obtainable foils are used, the known processes of gluing, flame-laminating and hot-laminating are generally

employed. In doing so, both coverings can be applied simultaneously, but sometimes each coating must be applied separately, for example in the case of electro-deposition operations.

When coated textile sheet-like structures are used as the covering, these structures can either b coated on one side, or on both sides. The application processes are the same as those described in the case of a foil coating.

The coatings can be applied in a radiation-transparent or radiation-opaque form. They can be rendered non-reflecting by admixing pigments or dyes, or rendered strongly reflecting by means of a mirror-like (metallised surface. Furthermore, by surface-texturing (embossing, calendering), they can be designed with effects which are, to a high degree, aesthetically attractive to the eye, or pleasing to the touch. Long-lasting surface effects may thus be obtained, such as slab-like or brick-like effects, and ceramic-like or slate-like shapes, as well as colours and print effects. Effects of this nature can be particularly desirable in the field of architecture.

The flammability of the cavity mat can be adjusted to conform with the fire regulations according to DIN 4102. In addition to the corrosion resistance, which is particularly characteristic of the synthetic coating agents, effective precautions against UV damage, aging and dirt deposition can also be incorporated into the coating layers, so that long, efficient service lives are guaranteed.

The design, according to the invention, of the cavity mat permits versatile use. Thus, good thermal and acoustic insulation is provided by the air cushion which is present in the cavity of the closed mat body, and it is possible to increase this insulation by enlarging the height of the cavity, without significantly increasing the cost or the weight. In the case of the solid insulating materials, the thermal resistance can, in contrast, be improved only by employing more material, with corresponding increases in weight and cost.

The same holds good for the barrier effect against moisture, this effect resulting, in the first instance, from the impermeability of the plastic which is used for the covering on both sides, and being additionally enhanced by the air reservoir in the cavity.

These properties can be exploited, in a cost-saving manner, when the mat is used as a solar collector, as a roof element or facing element which is thermally insulating and excludes moisture. In solar technology, the cavity mat is, moreover, a very efficient solar collector for all gaseous or liquid heat-transport media (wat r, air, oil). Furth rmor , the w ldability of the cavity mat enables the through-flow path to be designed in a very versatile manner. Figure 2 shows, as an example, how a system of tubes is formed by applying weld-seams (S) in the longitudinal direction (or in the transverse direction).

When the mats are used as solar energy collectors, special effects can be obtained through the design of the coverings. Thus, for xample, thin coverings, which are radiation-transparent, can be appli d on one side, whilst very high heat absorption (virtually complete absence of reflection) is obtained on the opposite side as the result of admixing pigments or dyestuffs, or strong deflection of radiation can be obtained by means of a mirror-like (metallised) surface. Good insulating effects can be obtained by means of foamed coverings, or by means of textiles, in sheet form, which are interlayered into the covering.

In order to illustrate the versatility of application, further reference may be made to various possible uses of the present cavity mat. Thus, it can be used, for example, as a flotation body, since the air cushion present in the cavity makes the mat permanently supportive and, moreover, provides additional effective protection against the cold and against hypothermia if the water temperature is low. Due to the high elasticity in compression, the product according to the invention is also suitable as a resilient mat for gymnastics and for jumping, as a non-slip underlay mat, and for many uses in textile-based construction.

The following Examples further illustrate the present invention.

Example 1

A laid structure, 100 mm high, made of metal wire of 1 mm ϕ is covered on both sides with coverings of black polyvinylidene fluoride, 2 mm thick, applied by hot-melting process.

Example 2

A laid structure, 50 mm high, made of monofilar polyester, of 3 mm ϕ is covered on one side with a covering of transparent polyurethane foil, 0.5 mm thick, and on the other side with woven polyester fabric, coated with PVC, 1.5 mm thick, inner side metallised.

Example 3

A laid structure of the type described in Example 2 is covered as described in Example 2 except that the woven polyester fabric is replaced by black textured PVC foil 1.5 mm thick, applied by the gluing process.

Example 4

A laid structure, 3 mm high, made of monofilar polyamide, of 0.15 mm ϕ is covered on one side with a layer of PVC foil, 1.5 mm thick, embossed in colour to simulate layers of bricks, the PVC foil being applied by a gluing process, th other side of the laid structure having a covering of coloured PVC foil, 1 mm thick, applied by a hot-melting process.

Claims

1. A flexible mat structure comprising a laid, sheet-like structure consisting of metal wire or synthetic yarn and having a fluid-tight covering on both sides, said covering being in the form of a sheet and being made of plastomers or

elastomers, so that a cavity is formed between these coverings, which persists under pressure and bending.

2. A mat according to Claim 1, wherein the laid structure consists of metal wire.

3. A mat according to Claim 1, wherein the laid structure consists of a monofilament yarn, a multifilament yarn, or a fibre yarn.

4. A mat according to any one of Claims 1 to 3, wherein the yarn of the laid structure is one which has been sheathed by dipping or spraying.

5. A mat according to any one of Claims 1 to 4, wherein the or each covering is a direct or indirect coating.

6. A mat according to any one of Claims 1 to 4, wherein the or each covering is a hot-melting foil or a cast foil.

7. A mat according to any one of Claims 1 to 4, wherein the or each covering is a foil which is attached by laminating.

8. A mat according to any one of Claims 1 to 4, wherein the or each covering consists of a coated textile sheet-like structure (woven fabric, nonwoven fabric, plaited fabric).

9. A mat according to any one of the preceding claims, wherein the two coverings consist of the same material.

10. A mat according to any one of the preceding claims, wherein the two coverings consist of different materials.

11. A mat according to any one of the preceding claims, wherein the two coverings have the same thickness, colour and transparency.

12. A mat according to any one of Claims 1 to 10, wherein the coverings have different thicknesses, colours and transparencies.

13. A mat according to any one of Claims 1 to 12, wherein one or both surfaces of the coverings are textured.

14. A mat according to any one of Claims 1 to 12, wherein one or both surfaces of the coverings are mirror-bright.

15. A mat according to any one of Claims 1 to 12, wherein one or both surfaces of the coverings are metallised.

16. A mat according to Claim 15, wherein the metallising coating is a metal foil.

17. A mat according to Claim 15, wherein the metallising coating is an electro-deposited coating.

18. A mat according to Claim 15, wherein the metallising coating is a vapour-deposited coating.

19. A mat according to any one of the preceding claims, wherein one or both coatings are electrically conducting as a result of the admixture of electrically conducting pigments or metallic particles.

20. A mat according to any one of the preceding claims, wherein the mat is formed with compartments.

21. A mat according to Claim 20, wherein the compartments are formed by welds.

22. A mat according to Claim 20 or 21, wherein the compartments extend longitudinally or transversely of the mat.

23. A mat according to Claim 1 substantially as described in any one of the foregoing Examples.

24. A mat according to Claim 1 substantially as described with reference to the accompanying drawings.

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